Older siblings, pets and early life infections: impact on gut microbiota and allergy prevalence during the first three years of life

Laursen, Martin Frederik; Zachariassen, Gitte; Bahl, Martin Iain; Bergström, Anders; Høst, Arne; Fleischer Michaelsen, Kim; Licht, Tine Rask

Publication date:
2014

Document Version
Publisher's PDF, also known as Version of record

Older siblings, pets and early life infections: impact on gut microbiota and allergy prevalence during the first three years of life

Martin Frederik Laursen[1#], Gitte Zachariassen[2], Martin Iain Bahl[1], Anders Bergström[1,3], Arne Høst[2], Kim Fleischer Michaelsen[3] & Tine Rask Licht[1]

[1]National Food Institute, Technical University of Denmark, Mørkhøj Bygade 26, DK-2860 Søborg, Denmark

[2]H.C. Andersen Children's Hospital, Odense University Hospital, Sdr. Boulevard 29, DK-5000, Odense C, Denmark

[3]University of Copenhagen, Department of Nutrition, Exercise and Sports, Rolighedsvej 30, DK-1958 Frederiksberg C, Denmark

Abstract

Background: Early life infections and presence of older siblings or pets in the household are factors known to affect the risk of developing allergic diseases, and this effect is suggested to be mediated by interactions between microbes and the immune system. However, very limited research has been done on the effect of these factors on the developing gut microbiota in infants. Thus, we aimed to elucidate associations between older siblings, pets and early life infections, the microbial gut communities at 9 and 18 months of age and the prevalence of allergies in three year old children.

Methods: Bacterial DNA was extracted from a total of 228 fecal samples obtained from 114 infants at both 9 and 18 months of age, belonging to the SKOT cohort. High throughput 16S rRNA gene sequencing was performed and the bacterial community composition of each sample was determined. Information on prevalence of respiratory allergy, eczema and presence of older siblings, pets and early life infections, previously collected through interviews with parents, were compared to the obtained data on bacterial taxonomy.

Results: Early life infections were positively associated with the risk of developing respiratory allergy ($p = 0.044$), while having siblings tended to decrease the risk of developing eczema ($p =$

0.105) before the age of three years. Having siblings correlated positively with the relative abundance of several gut microbial genera at both ages. At 18 months of age, microbial alpha diversity (p = 0.045) and richness (p = 0.009) were significantly higher in individuals with siblings, whereas in children with registered early life infections, a lower alpha diversity (p = 0.067) and richness (p = 0.023) was found at 18 months of age. However, gut microbiota composition, diversity and richness in children with allergies did not differ substantially from that in children without symptoms.

Conclusions: Early life infections might precede childhood respiratory allergy and are associated with low microbial diversity/richness during late infancy. The presence of older siblings affects the gut microbiota composition, diversity and richness during late infancy and the risk of developing eczema during early childhood. However, gut microbiota in late infancy was not associated with eczema or respiratory allergy in early childhood. Further studies are warranted to assess whether the profound sibling effect on the gut microbiota has implication for development of allergies later in life.